

In some instances, it may be desirable to use gas injection alone to increase heat transfer. In other instances, it may be desirable to use gas injection in combination with baffles 88 or another direct-contact agitation device. In still other instances, it may be desirable to use a combination of gas injection and liquid injection or a combination of gas injection, liquid injection, and direct-contact agitation devices. In even other instances, it may be desirable to use liquid injection with or without direct-contact mechanical agitation devices.

Once food products 32 have completed their journey through the blancher 20, they are discharged from the outlet 62. After that, the food products 32 can be packaged and shipped, packaged and frozen, stored, or further processed.

It is also to be understood that, although the foregoing description and drawings describe and illustrate in detail one or more embodiments of the present invention, to those skilled in the art to which the present invention relates, the present disclosure will suggest many modifications and constructions as well as widely differing embodiments and applications without thereby departing from the spirit and scope of the invention. The present invention, therefore, is intended to be limited only by the scope of the appended claims.

What is claimed is:

1. A blancher for heating a plurality of food products at the same time comprising:

- a) a food product-receiving chamber that has a food product inlet, a food product outlet, a heat transfer medium, and a plurality of food products received therein;
- b) a food product transport mechanism received in the food product receiving chamber for urging food products in the food product receiving chamber from adjacent the food product inlet toward the food product outlet; and
- c) an orifice disposed in fluid flow communication with the heat transfer medium from which a fluid under pressure is discharged into the food product-receiving chamber.

2. The blancher of claim 1 wherein:

- 1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;
- 2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;
- 3) the heat transfer medium is comprised of a liquid; and
- 4) the fluid is a liquid discharged from each of the orifices at a volumetric flow rate of at least 20 gpm for increasing heat transfer to the food products.

3. The blancher of claim 2 wherein the direct-contact mechanical agitation device comprises a baffle extending from the auger.

4. The blancher of claim 2 further comprising a tank that receives the heat transfer medium wherein the tank has an inlet through which the heat transfer medium is introduced.

5. The blancher of claim 4 wherein the tank further comprises an outlet through which the heat transfer medium is drained to empty the tank of the heat transfer medium.

6. The blancher of claim 2 wherein the blancher has at least as many orifices as there are auger flights and wherein there is an orifice disposed adjacent each one of the auger flights.

7. The blancher of claim 2 wherein there is an orifice between each adjacent pair of auger flights of the plurality of pairs of auger flights.

8. The blancher of claim 2 wherein there are two orifices between each adjacent pair of auger flights of the plurality of pairs of auger flights.

9. The blancher of claim 1 wherein:

- 1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;
- 2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;
- 3) the heat transfer medium comprises a liquid; and
- 4) the fluid is a gas discharged from each of the orifices at a volumetric flow rate of at least 60 CFM for increasing heat transfer to the food products.

10. The blancher of claim 9 wherein the direct-contact mechanical agitation device comprises a baffle extending from the auger.

11. The blancher of claim 9 further comprising a tank that receives the heat transfer medium wherein the tank has an inlet through which the heat transfer medium is introduced.

12. The blancher of claim 11 wherein the tank further comprises an outlet through which the heat transfer medium is drained to empty the tank of the heat transfer medium.

13. The blancher of claim 9 wherein the blancher has at least as many orifices as there are auger flights and wherein there is an orifice disposed adjacent each one of the auger flights.

14. The blancher of claim 9 wherein there is an orifice between each adjacent pair of the plurality of pairs of auger flights.

15. The blancher of claim 9 wherein there are two orifices between each adjacent pair of auger flights of the plurality of pairs of auger flights.

16. The blancher of claim 1 wherein:

- 1) there is a first plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the first plurality of orifices discharging a liquid under pressure into the heat transfer medium;
- 2) there is a second plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the second plurality of orifices discharging a gas under pressure into the heat transfer medium; and
- 3) the heat transfer medium comprises a liquid.

17. The blancher of claim 16 wherein the liquid discharged from each of the orifices of the first plurality of orifices is water.

18. The blancher of claim 16 wherein the gas discharged from each of the orifices of the second plurality of orifices is air.

19. The blancher of claim 1 wherein:

- 1) there is a first plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the first plurality of orifices discharging a liquid under pressure into the heat transfer medium;
- 2) there is a second plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the second plurality of orifices discharging a gas under pressure into the heat transfer medium;
- 3) the heat transfer medium comprises a liquid;

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- 4) the liquid discharged from each of the orifices of the first plurality of orifices is discharged at a volumetric flow rate of at least 20 gpm; and
- 5) the gas discharged from each of the orifices of the first plurality of orifices is discharged at a volumetric flow rate of at least 60 CFM.

20. The blancher of claim 19 further comprising a first manifold connected to the first plurality of orifices and a second manifold connected to the second plurality of orifices.

21. The blancher of claim 1 wherein the heat transfer medium comprises a liquid, the food product transport mechanism comprises an auger that rotates during operation, the auger having a plurality of pairs of spaced apart auger flights with one side of each of the auger flights entering the liquid heat transfer medium along one side of the blancher and another side of each of the auger flights exiting the liquid heat transfer medium along the other side of the blancher, and there are a plurality of pairs of orifices arranged in a bank that is disposed in the liquid heat transfer medium along the other side of the blancher.

22. The blancher of claim 21 wherein at least some of the food products tend to gather in a clump along the other side of the blancher and the orifices direct the fluid discharged therefrom toward the clump of food products.

23. The blancher of claim 1 wherein:

- 1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;
- 2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;
- 3) the heat transfer medium is comprised of a liquid; and
- 4) the liquid is discharged from each of the orifices at a pressure of at least 30 psi for increasing heat transfer to the food products.

24. The blancher of claim 21 wherein:

- 1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;
- 2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;
- 3) the heat transfer medium is comprised of a liquid; and
- 4) the fluid discharged from each of the orifices is a liquid at a pressure of at least 80 psi.

25. The blancher of claim 1 wherein:

- 1) the food product transport mechanism comprises an auger having a plurality of pairs of axially spaced auger flights that each has a direct-contact mechanical agitation device for agitating food products by direct contact;
- 2) there is a plurality of pairs of the orifices disposed in fluid flow communication with the heat transfer medium each for discharging a fluid under pressure toward the food products;
- 3) the heat transfer medium comprises a liquid; and
- 4) the fluid discharged from each of the orifices is a gas at a pressure of at least 2 psi and at a flow rate of at least 100 CFM.

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26. The blancher of claim 1 wherein:

- 1) there is a first plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the first plurality of orifices discharging a liquid under pressure into the heat transfer medium;
- 2) there is a second plurality of the orifices in fluid flow communication with the heat transfer medium, each of the orifices of the second plurality of orifices discharging a gas under pressure into the heat transfer medium;
- 3) the heat transfer medium comprises a liquid;
- 4) the liquid discharged from each of the orifices of the first plurality of orifices is discharged at a pressure of at least 30 psi; and
- 5) the gas discharged from each of the orifices of the first plurality of orifices is discharged at a pressure of at least 2 psi.

27. The blancher of claim 1 further comprising:

- 1) a tank;
- 2) a perforate drum disposed in the tank and which comprises the food product-receiving chamber;
- 3) a first bank of the orifices each in fluid flow communication with the tank and pointed toward the perforate drum wherein the first bank of the orifices extends in an axial direction relative to the tank and has at least two of the orifices;
- 4) a second bank of the orifices each in fluid flow communication with the tank and pointed toward the perforate drum wherein the second bank of the orifices extends in an axial direction relative to the tank and has at least two of the orifices; and
- 5) a third bank of the orifices each in fluid flow communication with the tank and pointed toward the perforate drum wherein the third bank of the orifices extends in an axial direction relative to the tank and has at least two of the orifices.

28. The blancher of claim 27 wherein each of the banks of the orifices is disposed between the tank and the perforate drum.

29. The blancher of claim 27 wherein the fluid discharged from each of the orifices passes through the perforate drum.

30. The blancher of claim 29 wherein the fluid discharged from each of the orifices impinges against at least one of the food products in the perforate drum.

31. The blancher of claim 1 further comprising:

- 1) a tank;
- 2) a perforate drum disposed in the tank into which are disposed the food products, wherein the food product transport mechanism is disposed in the perforate drum and rotates in a clockwise direction during operation;
- 3) a first bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the first bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii) the first bank of the orifices is disposed between a 6 o'clock position and an 8 o'clock position; and iii) a gas is discharged through each of the orifices of the first bank of the orifices;
- 4) a second bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the second bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii) the second bank of the orifices is disposed between a 7 o'clock position and a 9 o'clock position; and iii) a liquid is discharged through each of the orifices of the first bank of the orifices; and

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5) wherein the plurality of food products has a density of greater than 55 lbs/ft<sup>3</sup>.

32. The blancher of claim 1 further comprising:

- 1) a tank;
- 2) a perforate drum disposed in the tank into which are disposed the food products, wherein the food product transport mechanism is disposed in the perforate drum and rotates in a clockwise direction during operation;
- 3) a first bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the first bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii) the first bank of the orifices is disposed within about 65° of a centerline that extends perpendicular to horizontal and extends through the center of the perforate drum; and iii) a gas is discharged through each of the orifices of the first bank of the orifices;
- 4) a second bank of the orifices with each of the orifices in fluid flow communication with the tank, wherein i) the second bank of the orifices generally extends in an axial direction relative to the tank and has at least two of the orifices, ii) the second bank of the orifices is disposed within a band that extends between 45° and 85° of the centerline; and iii) a liquid is discharged through each of the orifices of the first bank of the orifices; and

wherein the plurality of food products has a density of greater than 55 pounds per cubic foot.

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33. The blancher of claim 32 wherein each of the food products is comprised of meat, the heat transfer medium is water at a temperature of at least 120° Fahrenheit, and the food product transfer mechanism is rotated such that each food product resides in the blancher for at least 3 minutes such that at least one of the food products is pasteurized.

34. The blancher of claim 33 wherein the food product transport mechanism comprises a helical auger having a plurality of pairs of axially spaced apart auger flights that have at least one baffle disposed between each adjacent pair of the auger flights.

35. The blancher of claim 1 wherein the heat transfer medium comprises a liquid, and further comprising a first conduit in fluid flow communication with the blancher, a second conduit in fluid flow communication with the orifice, and a pump in fluid flow communication with the first conduit and the second conduit that withdraws the liquid heat transfer medium and discharges the liquid heat transfer medium out the orifice.

36. The blancher of claim 1 further comprising an atmosphere in the blancher, a first conduit in fluid flow communication with the blancher, a second conduit in fluid flow communication with the orifice, and a pump in fluid flow communication with the first conduit and the second conduit that withdraws the atmosphere and discharges the atmosphere out the orifice.

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